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NHTSA-04-18864-10

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A ISO 9001 Company

DATE: October 8, 2004

The Honorable Jeffery W. Runge, M.D.
Administrator
Docket Management Facility
U.S. Department of Transportation
400 Seventh Street, SW
Nassif Building, Room PL-401
Washington DC 20590-001

SUBJECT: Comments to NPRM; ATD ES-2re Side Impact Crash Test Dummy 50th Percentile Male.
Docket No. NHTSA 2004-18864, RIN 2127-A189

Dear Dr. Runge,

Denton ATD Inc. would like to submit these comments in response to the NHTSA NPRM for the ATD ES-2re Side Impact Crash Test Dummy 50th Percentile Male in Docket No. NHTSA 2004-18864. Denton ATD does generally support the ES-2re but has some technical concerns.

Background

Denton ATD is one of the two major manufacturers of crash test dummies in the world. Denton ATD believes that is necessary to have a complete definition for any crash dummy which is used in a crash standard. A complete specification package is necessary to maintain the definition of Reproducibility. Denton ATD's definition of "complete" includes definition of all 3 dimensional shapes with a pattern (definition of surfaces) with tolerances and complete material specifications. An electronic pattern for 3D Definition of the arm flesh, is attached for NHTSA to review as an example.

Material definitions should either give detailed information to allow exactly the same material to be purchased or give performance based specifications for the material. Denton ATD's conclusion regarding the current drawing package in the docket for the ES2-re, is that it is not adequate for a dummy to be reproduced because of gaps and/or possible errors of information. Two of these gaps include complete 3D shapes and complete material information.

3D Shape and Material Definitions for the ES-2re

The ES-2re dummy contains several 3D shapes. This includes the head skin, skull, cap skin, skull cap, arm, abdomen, pelvis flesh, illac wing, and lower leg/foot fleshes. Denton ATD would like to request guidance from NHTSA regarding the two items discussed above, 3D shape definition and material specifications:

3D Shape Definition

Pattern Method for Shape Definition

Denton ATD considers the 3D shape of all components in a dummy to be important to assuring reproducibility of dummies in sled and full vehicle use. Differences in 3D shape could cause subtle differences in initial setup positions and contact times with vehicle interior components. Further, the performance of a dummy is a complex system of shapes and materials. Differences in the 3D shape of components could lead to dummies which perform the same in the lab verification tests, but give a different response in sled or vehicle tests where loading conditions and input frequencies are very different from the verification test.

Due to our concern about having an objective 3D shape definition for the dummy, Denton ATD strongly recommends that NHTSA specify 3D patterns for all complex dummy parts. These patterns must be durable to last several decades, must be stored and maintained by NHTSA to have traceability for the rule, and must be available now and as long as the rule is in effect to anyone who wants to verify the basic shape of dummy components or start building the dummy.

These goals can be achieved using physical patterns made from stable materials. This was done for the original 49 CFR part 572 subpart E dummy. It calls out patterns on its drawings of complex parts, such as the head skin. However, NHTSA needs to keep the patterns identified, stored, and controlled so that their authenticity and quality does not degrade or become suspect over several decades.

These goals can be attained most easily by using electronic patterns that can be placed in the docket. Computer files based on international standards, such as STEP files, can provide a complete, objective, and durable 3D definition of parts. There is precedence for this practice in the ISO Worldsid project. ISO CD 15830 includes reference to a web site where STEP file definitions of all complex 3D shapes are available. An electronic pattern would enable anyone that would need to verify a shape could do this by digitizing the shape and comparing it to the electronic pattern. Tolerance bands or a number or points could be developed to determine compliance.

Denton ATD is providing with these comments STEP file definitions for the Arm (pn 175-3501) Denton ATD can also provide STEP files defining other parts of the dummy, upon request, if NHTSA chooses to use them to define the 3D shapes of this dummy.

Denton ATD requests NHTSA to consider the two options for 3D patterns. Denton ATD feels this is the best method of obtaining the greatest reproducibility of the dummies and prevent future changes that can not be checked.

Non-Pattern Method for Shape Definition

If NHTSA does not adopt a pattern method for defining 3D shapes, Denton ATD requires assistance from NHTSA by responding to the following questions:

NOTE: Currently minimum overall anthropometry dimensions and segment weights are provided on a 2D drawing of a complex shape, such as a head.

1. Does a part only need to be similar to the shape shown on the 2D drawing and fall within the controlling dimensions for overall size on the drawing?

2. Is it necessary to match the 3D shape of the actual dummies used to develop the rule? Due to the fact that some parts change with age and use, it is difficult to use actual dummies as a shape standard.

3 Is it permissible to change the 3D shape of the parts as long as the overall dimensions on the drawing and Part 572 verification tests are met? For example, can a head skin and skull be revised to elliptical cross sections as long it meets the overall external dimensions, head assembly weight, and drop test requirements?

4 How will NHTSA inspect a 3D shape for acceptance upon deliver from a dummy manufacturer?

Material Definitions for ES-2re:

Denton ATD considers the dynamic material properties of every part in the dummy to be important to achieving a reproducible dummy. This has been a difficult issue in specifying every previous dummy in part 572. Several problems can arise. If materials are insufficiently specified, then reproducibility issues may arise over time as various dummy manufacturers chose different materials as availabilities change. If manufacturers and part numbers, or even national standards are applied, then it may be impossible to purchase what is specified over time as standards change and as materials are obsoleted by their manufacturers.

Currently the drawing package in the docket has problems. One example is the pelvis flesh (pn 175-6050) which specifies "PVC/PU FOAM" for the material. This could be met by an extremely wide variety of materials with very different properties, so this part is underspecified. Another example is the M-rail (pn 175-4011). This part is a needle bearing outer race where material strength and surface hardness are critical to performance, and yet the only definition is "STEEL".

Denton ATD recommends that NHTSA try a different approach and give performance based specifications for all materials. We suggest that a drawing be developed for each material used in the dummy, and that all other drawings refer to these drawings for material specifications. For metals, the drawing should call out the density with a tolerance, minimum tensile strength, and hardness with a tolerance. For materials that require a dynamic performance (such are rubbers, urethanes, foams), they should have basic performance based specifications such as density with a tolerance, some type of stiffness specification with a tolerance, and a measure of the damping of the material with a tolerance. Various ASTM standards are available for measuring rubbers, foams, urethanes, etc. Using this approach of providing minimal performance based specifications should provide dummy reproducibility now and in the future, and should allow dummy manufacturers to replace and improve materials as technology changes. For example, if instead of specifying a nitrile rubber for the neck, a performance based specification could be used so that other rubber blends could be developed to make the component more repeatable, reproducible, and stable.

Denton ATD requests NHTSA for specification assistance on the materials listed in the ES-2re drawing package. Some materials are not available from our vendors.

Examples from the drawing package:

6082 aluminum, 080M40 Steel, PT4 vinyl, BS 1449 CS70, UREOL 100 226 cast aluminum

Overall Drawing Package Comments

As part on a NHTSA drawing package project, Denton ATD provided a drawing package for the ES-2re. The drawing package was developed by measuring two of NHTSA's ES-2re dummies, serial numbers 70 & 71. There appears to be differences between Denton ATD's measurements of NHTSA's dummy serial number 70 & 71 and the current drawing package. These issues have been presented to the Vehicle Research and Test Center (VRTC)/NHTSA on September 22, 2004. If required, Denton ATD can submit a list.

If you have any questions or comments, please feel free to contact me by phone (419) 625-5200, or by fax at (419) 625-5335, or by e-mail at mikeb@dentonatd.com.

Sincerely,

Michael S. Beebe
Senior Vice President of Operations
Denton, Inc.

Attachment: File for Arm Flesh 175-3501

AVAILABILITY OF NON-SCANNABLE ITEMS

NHTSA-04-18864-10

Docket / Document Number

Old Docket Number, If any

Part of Denton ATD, Inc. Comments
2 CD's

Name / Description of Item(s) non-scannable

MAY BE VIEWED IN DOCKETS- Room 5111
Carolyn Green X64939

Agency / Office Name / Room Number / Contact Person (if any)

during the hours of 9:00 am ~ 5:00 pm.

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